REMARKS

As an initial matter, Applicant thanks the Examiner for the courtesies extended to the undersigned in the interview in person on April 27, 2006.

Claims 2-20 were pending in the subject application, with claim 1 having previously been canceled, without prejudice or disclaimer. By this Amendment, claims 2 and 20 have been canceled, without prejudice or disclaimer, new independent claim 21 has been added, and claims 3-5, 7, 8, 10, 11 and 19 have been amended to depend from new claim 21. Accordingly, claims 3-19 and 21 are now pending, with claim 21 being the sole pending claim in independent form.

Support for new claim 21 may be found, inter alia, in the specification at page 3, line 20 through page 5, line 1; page 6, lines 13-20; page 13, lines 15-19.

Rejection under 35 U.S.C. §112, first paragraph

On page 2 of the December 1, 2005 final Office Action, claims 2-20 were rejected under 35 U.S.C. §112, first paragraph, as purportedly failing to comply with the written description requirement.

The Office Action stated that the claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The Office Action further stated that applicants' now claimed range of variation of air-permeability throughout the entire body values was not described in the specification in such a way as to reasonably convey to one

skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The Office Action also stated that support for this range of values is not found in applicants' support disclosure. The Office Action stated that this is a new matter rejection.

As discussed in the April 27, 2006 interview, support for the claim feature that variation in air-permeability throughout the entire body of the foam is not more than 1 $cc/cm^2/sec$ can be found in the application at, for example, page 3, lines 20-24. Additional support for the claim feature can be found in the application in the summary of examples in Table 1 at page 32.

Reconsideration and withdrawal of the rejection under 35 U.S.C. §112, first paragraph, is respectfully requested.

Rejection Under 35 U.S.C. §112, Second Paragraph

On page 3 of the December 1, 2005 Office Action, claims 1-20 were rejected under 35 U.S.C. §112, second paragraph, as purportedly indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The Examiner stated that applicants' claims are confusing because it cannot be determined if the processes as claimed, defined by the language "...is enabled to be formed without...", are inclusive of methods of preparation including cell-opening operations.

The Examiner stated that this limitation of applicants' claims constitutes as a process step what is not done rather than setting forth a positive process step as is required when

claiming a process. The Examiner further stated that although applicants may exclude elements and process operations by limitation in the claims, such exclusion cannot be the only process limitation defined by the claims.

The Examiner stated that this limitation is rendered further confusing when the terminology "healthy bubble" is looked at in light of the supporting disclosure. The Examiner further stated that "healthy bubble" in the context of this invention is understood to mean the step of opening cells by destroying the membranes of the cells. The Examiner also stated that "healthy bubble", from the standpoint of claim interpretation, can be cell opening/membrane destruction through any means, and that forming open-celled blocks, by definition, employs the very operation, "healthy bubble", that applicants are claiming to avoid. The Examiner also stated that it cannot be determined, in the instant case, what cell opening/membrane destroying operations constitute "healthy bubble" and which ones do not.

The Examiner stated that the term "healthy bubble" from the standpoint of claim interpretation cannot be afforded the definition of "healthy bubble" proffered by applicants' supporting disclosure at page 7 bridging page 8.

By this Amendment, claims 2 and 20 have been canceled, without prejudice or disclaimer, new independent claim 21 has been added as a replacement for claim 20. It is submitted that claim 20 clearly and distinctly points out the subject matter which applicant regards as the invention.

The term "healthy bubble", as discussed in the April 27, 2006 interview, refers to regional discharge of a gas from the top

surface of the foam block when the foam height reaches its maximum point. Further, the term "healthy bubble" indicates the step of making cells to intercommunicate to each other, by destroying the cell membranes with the gas regionally discharged from the top surface of the foam block when the foam height reaches its maximum point. See the application at page 7, lines 8-17 (in particular, lines 15-17).

Reference Material 1 (Demonstrative Fig. 1) shows various cell states of a polyurethane foam which demonstrate the relationship between the cell membranes of polyurethane foam and its air permeability. Fig. 1(A) shows the skeletal structure of cells 1 of a polyurethane foam and schematically shows an aggregate of 3 cells. Fig. 1(B) illustrates a state (called closed-cell foam) in which a membrane 2 is still attached to each and every window of the cells. Fig. 1(C) illustrates a state in which at least one of cell membranes 2 located between adjacent cells 1 is opened and thus the adjacent cells 1 are connected to each other. The state in which cells are made to intercommunicate to each other is called open-cell foam. Fig. 1(D) illustrates a state in which not so many cell membranes 2 remain in the respective windows 3 (that is, the membrane remaining ratio is low). As the number of remaining cell membranes decrease, the air-permeability becomes higher.

As can be seen in video number 1 on the optical disc submitted to the Examiner in the April 27, 2006 interview, and in Reference Materials 2 and 3 (Demonstrative Figs. 2 and 3) in Exhibit A attached hereto, conventional open-cell type flexible polyurethane foams are manufactured through the cell opening step called "healthy bubble" to destroy the cell membranes. As discussed in the April 27, 2006 interview in connection with

Reference Materials 2 and 3 (Demonstrative Figs. 2 and 3), opening of cells and intercommunication between cells in the conventional method with healthy bubbles occur after the expansion of foam is finished (that is, when the foam height reaches its maximum). Reference material 2 (demonstrative Figure 2) corresponds to a conventional method for forming flexible polyurethane foam including a "blow off" (healthy bubble) step. The source of Reference Material 2 is R.B. Turner et al., Advances in Urethane Sci. & Tech., 11 (1992).

Reference Material 3 also corresponds to the mechanism of a conventional method for forming flexible polyurethane foam. The main flow of the mechanism is illustrated in Figs. 3(A) to 3(D). At these steps, the events shown in Figs. 3(A') to (D') take place, respectively, inside the polyurethane foam. In Fig. 3(A), the raw materials are stirred and mixed, and as shown in Fig. 3(A'), bubble nucleation occurs and gelation starts. In Fig. 3(B), the materials are processed into cream, and as shown in Fig. 3(B') gas is generated, bubbles expand, resin reaction occurs and cells are not opened. In Fig. 3(C), rising of the materials occurs while the gas is maintained, and as shown in Fig. 3(C') gas is further generated, the internal pressure is increased, resin reaction occurs and cells are not opened. In Fig. 3(D), when the foam reaches its maximum height, healthy bubble occurs to open the cell membranes, and as shown in Fig. 3(D') when the expansion of the foam is finished, the maintained gas is discharged all at once, that is, since the maintained gas moves upwards all at once as indicated by arrow X, the higher the region, the more cell membranes are destroyed. Therefore, the difference in the air permeability between the upper, middle and lower regions of the obtained foam block becomes large. Fig. 3(E) is a schematic diagram showing cells of the upper region of

the foam block, and more cell membranes are destroyed in the upper region. Fig. 3(F) is a schematic diagram showing cells of the lower region of the foam block, and more cell membranes remains undestroyed in the lower region. Figs. 3(E') and 3(F') show SEM images corresponding to Figs. 3(E) and 3(F), respectively.

"Healthy bubble" was conventionally believed to be an indispensable step in the manufacture of satisfactory flexible polyurethane foam, because in earlier efforts to manufacture flexible polyurethane foam, by forming a closed-cell type foam (that is, without healthy bubble), the foam contracted after it rose to its maximum height (due in part to the increase in temperature inside the foam from reaction heat which could not be funneled out) since the temperature eventually decreased causing a corresponding reduction in volume of the foam (see video number 2 on the optical disc).

When the conventional method with healthy bubbles is utilized, the quantity of gas passing through the foam block increases gradually over the region extending from the middle portion up to the upper portion, and therefore the air-permeability is higher in the upper portion than in the lower portion. Variation in air-permeability is created in the foam block as a whole. See discussion in the application, for example, page 8, lines 15 to 23.

While as pointed out in the application (for example, page 8, lines 5-14), the "opening cells step called healthy bubble" has been considered conventionally as an essential step in the manufacture of open-cell polyurethane foam in this technical field for a long time, the techniques of the claimed invention of

the present application, as recited in the new claim 21 and also as recited in the claims as originally filed, produces a low air-permeability flexible polyurethane foam block **without** accompanying the cell opening step called healthy bubble.

As discussed in the April 27, 2006 interview and as shown in Reference Material 4 (Demonstrative Fig. 4) in Exhibit A attached hereto, when the techniques of the present application are utilized, the intercommunication between cells starts before the foam height reaches its maximum point in a relatively early stage of the reaction, and part of the generated gas diffuses into the air one after another from the entire top surface of the foam block.

Reference material 4 shows a mechanism of a method of forming flexible polyurethane foam, according to an example of the techniques of the present application. The main flow of the mechanism is illustrated in Figs. 4(A) to (D). At these steps, the events shown in Fig. 4(A') to (D') take place, respectively, inside the polyurethane foam. In Fig. 4(A) the raw materials, are stirred and mixed, and as shown in Fig. 4(A') bubble nucleation occurs and gelation starts. In Fig. 4(B), while processing the materials into cream, cells are opened, and while opening the cells, gas is formed from gas bubbles that are so fine that they cannot be seen by naked eyes. As shown in Fig. 4(B'), gas is generated and the cells are opened, while resin reaction occurs. In Fig. 4(C), the cells are opened and while opening the cells, further gas is created from fine gas bubbles and resin reaction occurs. In Fig. 4(D), healthy bubble does not occur as the foam reaches its maximum height. Since healthy bubble does not occur along with conclusion of the expansion of the bubbles, as shown in Fig. 4(D'), a foam block with no

substantial dispersion in property can be obtained. Therefore, there is no substantial difference in the air permeability between the upper, middle and lower regions of the foam block obtained. Fig. 4(E) is a schematic diagram showing cells of the upper region of the foam block, and there are very fine holes formed uniformly in the cell membrane. Fig. 4(F) is a schematic diagram showing cells of the lower region of the foam block, and the cells are in a similar state to that shown in the diagram of the cells of the upper region. Fig. 4(G) is an SEM mage of Fig. 4(E) or 4(F). That is, regardless of what portion of the foam block, the sample is taken, it is observed that very small holes are uniformly opened in similar cell membranes. The gas pressure inside the foam block and the regional concentration of gas within the foam block are released as the foam rises, the cells are opened without the opening cells step called healthy bubble, and the variation in air-permeability does not substantially occur. See the application, for example, page 24, lines 4-21.

By applying the techniques of the present application, with use of a specific foam stabilizer, a low air-permeability flexible polyurethane foam block without accompanying an opening cell step called healthy bubble, having an air-permeability of no more than 5 $cc/cm^2/sec$ at a thickness of 10 mm and a variation in air-permeability between regions of the foam block being no more than 1 $cc/cm^2/sec$ (see video number 3 on the optical disc submitted to the Examiner) can be obtained. Applicant found that when polysiloxane-polyoxyalkylene copolymer having a specific chemical structure is employed as a foam stabilizer, it is possible to manufacture, under relatively stable conditions, a flexible polyurethane foam block which is capable of overcoming the aforementioned problems associated with healthy bubble.

Reconsideration and withdrawal of the rejection under 35 U.S.C. §112, second paragraph, is respectfully requested.

Rejection Under 35 U.S.C. §102

On page 4 of the December 1, 2005 Office Action, claims 1-20 were rejected under 35 U.S.C. §102(b) as being anticipated by purportedly anticipated by U.S. Patent No. 4,264,743 to Maruyama et al.

The Examiner stated that Maruyama discloses preparations of flexible open-celled polyurethanes having low-air permeability and being formed from feedstock including polyols, isocyanates, catalysts, foaming agents, oxyalkylene-siloxane foam stabilizers, and hydrocarbon fluid compounds which read on the processes and products claimed. Further, even though the disclosure of the reference is not seen to be limited to its illustrative examples of silicon foam surfactants, Maruyama does disclose specific hydroxyl function polysiloxane-polyoxyalkylene copolymers meeting the ranges of values of applicants' claims.

The Examiner further stated that Maruyama formed products appear to have consistency in permeability values throughout the samples they test. Since difference is not seen in the products realized, it is seen that the ranges of variation of air permeability values now recited in applicants' claims are inherent to the teaching of Maruyama. Additionally, without applicants' ranges of permeability values being based on specific sample thicknesses, they are seen to be of little distinguishing value in the patentable sense.

The Examiner went on to state that Applicants' arguments have been considered, but rejection is maintained for the reasons set

forth hereinabove.

The Examiner stated that Maruyama is maintained to disclose examples of open-cell polyurethane foams having air permeabilities as claimed. Further, difference between the processes of Maruyama and the processes of the claims are not established in fact or seen based on the manufactured products resulting from the processes.

Applicant maintains that the claimed invention cannot be anticipated by Maruyama because Maruyama fails to disclose each and every element of the claimed invention.

Maruyama, as understood by Applicant, proposes an open-cell, polyurethane foam sealing material having a desired waterproofness property. Maruyama proposes the use of a silicone surfactant as a foam stabilizer, and the silicone surfactant is selected based on its influence on the waterproofness property.

Maruyama provides a number of examples, the molecular weight of the silicone surfactant used in the examples is 1700, 2000 or 2100. Maruyama, however, does not indicates a preferable range of the number average molecular weight of the polyoxyalkylene chain of polysiloxane-polyoxyalkylene copolymer.

As discussed in the present application, page 2, line 13 to page 3, line 13, it is known that using a high-viscosity polyol such as dimer acid-based polyol in the manufacturing of a low air-permeability flexible polyurethane foam by inevitably creates a variation in air-permeability of 2 to 15 $cc/cm^2/sec$ between the regions of the obtained foam block. However, such an approach is accompanied by the problem that a polyurethane foam block having

a desired low air-permeability can be obtained only in the lower region, or lower to middle regions of the foam block.

Further, Maruyama makes no mention of the size of the foam block (whether it is a very small sample that is made in laboratories or a large foam block manufactured in a production line), and does not at all indicate what regions of the foam block the samples used in the Examples were taken. In addition, Maruyama makes no mention whether or not there is a variation in air permeability between regions of the foam block.

Further, a number of examples provided in Maruyama suggest that the cell membranes must be destroyed by crushing (that is, mechanically compressing). See, for example, Maruyama, column 16, lines 18 to 19. In other words, such foam is of a closed-cell type, and it is understood from the description that a low air-permeability urethane foam of an open-cell type is obtained from such a closed-cell type foam by crushing the cell membranes are slightly destroyed.

In contrast, according to the claimed invention of new claim 21, a polysiloxane-polyoxyalkylene copolymer containing a function group capable of chemically bonding to an isocyanate group at a terminal of polyoxyalkylene chain, the polyoxyalkylene chain having a number average molecular weight ranging from 400 to 1000, and a weight ratio between ethylene oxide and propylene oxide in the polyoxyalkylene chain being in a range of 70/30 to 0/100, is used as the foam stabilizer. With this structure, a sufficient foam stabilizing power for forming foam is exhibited, and the generated gas diffuses into the air one after another from the entire top surface of the foam block. Therefore, the cells are thus made to intercommunicate with each other, and thus

it is possible to manufacture a very low air-permeability polyurethane foam block with no substantial variation in air-permeability between the regions of the foam block without accompanying the opening cells step called healthy bubble without decreasing the speed of production. See application, page 16, line 21 to page 17, line 7.

According to the present invention, a foam block substantially free from variation in air permeability throughout the entire body thereof can be obtained. Such a feature of the claimed invention provides a solution to the problem of conventional techniques that a polyurethane foam block having a desired low-air permeability can be obtained only in the lower region, or lower to middle regions of the foam block. Applicant also found that the claimed invention also brings an extraordinary improvement in the yield of the product.

As described above, Maruyama does not disclose or suggest the claimed invention of claim 21 of the present application, that is, a method of manufacturing a very low air-permeability polyurethane foam block without accompanying the opening cells step called healthy bubble, which has a variation in air-permeability between the regions of the foam block being no more than 1 $cc/cm^2/sec$. That is, Maruyama and the claimed invention of claim 21 of the present application are different from each other not only in structure but also in advantageous effect.

Regarding claims 3-19, Applicant respectfully points out that claims 3-19 depend on and include all the limitations of claim 21. Thus, claims 3-19 are patentable at least for the reasons set forth above with respect to claim 21.

In view of the amendments to the claims and remarks hereinabove, Applicant maintains that claims 21 and 3-19 are now in condition for allowance. Accordingly, Applicant earnestly solicits the allowance of the application.

If a telephone interview would be of assistance in advancing prosecution of the subject application, Applicant's undersigned attorney invites the Examiner to telephone him at the telephone number provided below.

If a petition for an extension of time is required to make this response timely, this paper should be considered to be such a petition, and the Commissioner is authorized to charge the requisite fees to our Deposit Account No. 03-3125.

No fee is deemed necessary in connection with the filing of this Amendment. However, if any additional fee is required, authorization is hereby given to charge the amount of any such fee to Deposit Account No. 03-3125.

Respectfully submitted,

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I hereby certify that this correspondence is being deposited this date with the U.S. Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Paul Teng — May 1, 2006

Paul Teng
Reg. No. 40,837 — Date